

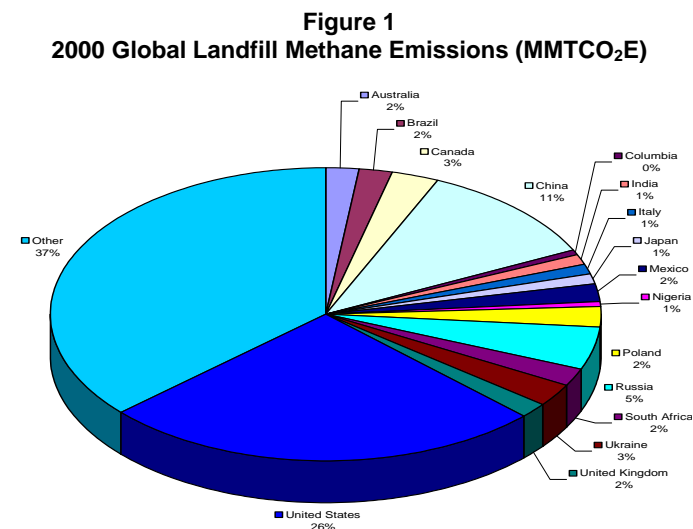
INTERNATIONAL OPPORTUNITIES FOR PROJECT DEVELOPMENT: RECOVERY AND USE OF METHANE FROM LANDFILLS

Methane is a primary constituent of landfill gas (LFG) and a potent greenhouse gas when released to the atmosphere. Reducing emissions by capturing LFG and using it as an energy source can yield substantial energy, economic and environmental benefits. The implementation of landfill gas energy (LFGE) projects reduces greenhouse gases and air pollutants, leading to improved local air quality and reduced possible health risks. LFG projects also improve energy independence and produce cost savings, create jobs, and help local economies. Internationally, significant opportunities exist for expanding landfill gas energy.

BACKGROUND ON GLOBAL LANDFILL METHANE EMISSIONS

Each day millions of tons of municipal solid waste are disposed of in sanitary landfills and dump sites around the world. Landfill gas (LFG) is created as a natural by-product of decomposing organic matter such as food and paper disposed in these landfills. LFG consists of about 50 percent methane (CH_4), the primary component of natural gas, about 50 percent carbon dioxide (CO_2), and a small amount of non-methane organic compounds.

Globally, landfills are the third largest anthropogenic (human-influenced) emission source, accounting for about 13 percent of global methane emissions or over 818 million metric tonnes of carbon dioxide equivalent (MMT CO_2E). Figure 1 identifies some of the countries with significant methane emissions from landfills.

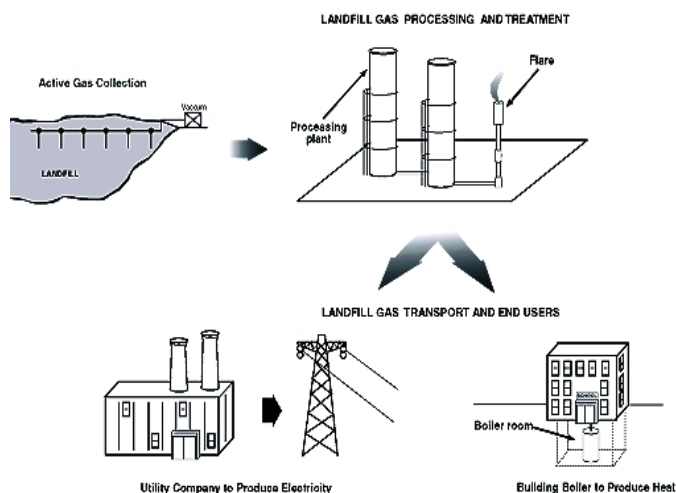


The major factors driving LFG emission levels are the amount of organic material deposited in landfills, type of landfilling practices, extent of anaerobic decomposition, and the level of landfill methane recovery and combustion (e.g., energy use or flaring).

RECOVERY AND USE OPPORTUNITIES

LFG is extracted from landfills using a series of wells and a vacuum system, which directs the collected gas to a point to be processed (see Figure 2). From there, the LFG can be used for a variety of purposes. One option is to produce electricity with engines, turbines, microturbines, and other technologies.

Figure 2: Landfill Gas Capture and Use Overview



A second option is to process the LFG and make it available as an alternative fuel to local industrial customers or other organizations that have a need for a constant fuel supply - direct use of LFG is reliable and requires minimal processing and minor modifications to existing combustion equipment. A third option is creating pipeline quality gas or alternative vehicle fuel with LFG.

ISSUES FOR PROJECT DEVELOPMENT

To successfully develop LFG energy projects, there are a range of issues that need to be addressed. At a minimum a successful project will require:

- Estimation of LFG recovery potential at the candidate landfills and a preliminary feasibility assessment,
- Access to capital markets and an economic feasibility assessment to examine end use options and support efforts to obtain financing,
- Determination of the project structure (e.g., management, engineering, and construction), and



METHANE TO MARKETS PARTNERSHIP

- Determination of gas rights ownership, energy sales contracts, and securing permits and approvals, as applicable.

- Technology transfer through demonstration, training and workshops, and
- Creating an environment for sound investment.

One important issue for project development is that open dumps and unmanaged landfills are the predominant disposal options in many developing countries. These sites can be less than optimal candidates for LFG energy development due to small amounts of methane (resulting from aerobic degradation and rapid waste decomposition). However, many developing countries are currently transitioning to landfills from more uncontrolled systems. Landfills will provide a more environmentally sound disposal option for these countries, but they also will produce more methane. The Methane to Markets Partnership can help facilitate a transition to landfilling by sharing information on effective landfill design and management, and how to integrate landfill methane capture and beneficial use into these planning processes.

Another important issue for LFG energy project viability in both developing and developed countries is energy price structure. Government policies on energy and solid waste management can promote or hinder the beneficial use of LFG. An uncertain regulatory environment is often a concern among potential investors. For example, project developers can be subject to different and sometimes conflicting laws at the local, regional and national levels. Moreover, a lack of regulations governing landfills and LFG energy projects (i.e., no requirement or incentive to collect and combust LFG) in some countries can inhibit project development.

As countries begin to implement laws, regulations, and policies to improve solid waste management practices, promote alternative energy, and address greenhouse gas emissions, the economic viability of LFG energy projects will improve. Moreover, creating an atmosphere where potential investors (private sector, international development banks, and financiers) are secure in the technical and policy framework that supports LFG energy projects will be essential to project development.

The Methane to Markets Partnership will bring together the collective resources and expertise of the international community to address technical and policy issues and facilitate LFG energy projects. Early initiatives will likely include:

- Assisting with solid waste management capacity building,
- Identifying potential landfill resources,
- Performing initial gas generation and feasibility studies,

LFG capture and use is a reliable and renewable fuel option that represents a largely untapped beneficial environmental and energy opportunity at thousands of landfills around the world. Cooperation with the Methane to Markets Partners will help ensure that more LFG reaches the energy market.

PROJECT CASE STUDY

Metropolitan Solid Waste Processing System (SIMEPRODESO) Landfill Gas Energy Project Monterrey, Mexico

In Mexico, methane emissions from landfills contribute to 10% of the total human-influenced greenhouse gas emissions. Beginning in 2001, the city of Monterrey, Mexico, a city of nearly 4 million people which disposes of over 4,500 tons of MSW a day in the SIMEPRODESO landfill, explored an opportunity to harness methane from the landfill for energy recovery while reducing methane emissions.



A joint venture between government and business interests turned a liability into an asset by converting LFG into electricity to help drive the public transit system by day and light city streets by night. Funded in part by a \$5 million grant from the Global Environmental Facility, the seven megawatt plant provides enough equivalent power to light up over 15,000 homes. In fact, 80 percent of the municipal government's electricity needs will be met by the \$12 million project. Moreover, as the Simeprodeso landfill continues to expand, LFG generation is estimated to increase to fuel a 25-megawatt facility, on the books for completion by 2016.

The success of this project represents an institutional structure for the implementation of additional LFG energy projects, with private sector participation, and strengthened regulatory and social frameworks for LFG introduction in Mexico, as well as providing an example of applied technologies that can be replicated elsewhere in Mexico and Latin America. Already other Mexican cities and private companies are studying LFG potential as a cheaper and cleaner alternative to traditional fossil fuels that generate most of Mexico's electricity.

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